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Return to:

INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

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GAS ABSTRACTS

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CONTENTS

1. Gas Industry 189

2. Appliances 189

3. Combustion and Industrial Furnaces 191

4. Carbonization and Gasification 193

5. Natural Gas and Natural Gas Condensates 195

6. Petroleum and Synthetic Liquid Fuels 200

7. Analytical Methods and Tests 201

8. General and Physical Chemistry 203

9. Organic Chemistry 205

10. Chemical Engineering 205

11. Process Equipment and Instrumentation 207

12. Materials of Construction 208

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1. GAS INDUSTRY

Canadian Activities

Wilson, G. CANADA! WESTERN AREAS RETRENCH AS MARKETS LIMITED. NEW DISCOVERIES BRIGHTEN FUTURE. *World Oil* 139, 120-24; 126 (1954) August 15.

Western Canada produced 80.5 million barrels of crude in 1953, a 32 per cent increase over 1952. A number of significant discoveries were made, especially in the Pembina, Alberta area. Even so, operators retrenched somewhat last year because of temporary limitation of markets. An optimistic note was the selection of a single company for construction of a large transmission line to bring Alberta gas to eastern markets. E. B. Shultz

Industry Ownership

Lloyd, E. F. MORE ON THE SMALL SHAREHOLDER. *Public Utilities Fortnightly*, 54, 251-58 (1954) September.

The percentage of small shareholders has been increasing during the past few years. Many stock purchasing plans are offered for the small shareholder. The political influence of this growing group of people will become very important during the next few years.

W. G. Bair

Legislation

Ralph, H. D. IS OIL REGULATION BY FPC NEXT? *Oil Gas J.* 53, 132-33, 135-136. (1954) September.

Governor Arn of Kansas and two other speakers, presidents of gas and oil companies, expressed the fear that state regulation of oil production and conservation is doomed unless Congress moves to curb FPC gas authority and reverses the effects of the Supreme Court decision in the Phillips case. These opinions, along with predictions of federal regulation of oil as the next step, were given before the Interstate Oil Compact Commission. But FPC representatives defended their order 174-A as being the most practical course under the circumstances. Speaking before the Independent Natural Gas Association of America, two commissioners hinted that if the order is ignored, gas producers run the risk of being regulated by older, more onerous provisions of the Natural Gas Act designed specifically for pipelines.

E. B. Schultz

Education

UNIVERSITY OF HOUSTON SPAWNS GAS ENGINEERS IN THE HEART OF THE PETROLEUM PRODUCING COUNTRY. *Gas* 30, 45-47 (1954) September.

The course of development of the Department of Petroleum Engineering at this university is traced from its beginning in 1947 to the present. The courses involving natural gas production and transmission are given emphasis. The gas laboratory, and the work done therein, is described. Men who teach the gas engineering course are introduced. The operation of an efficient student placement center is reviewed along with the functioning of a student screening program. It is interesting to note that this school has one of the largest enrollments in the South, yet is a relatively young institution.

Publisher's Abstract

Regulation

Ralph, H. D. INDUSTRY OBJECTS TO GAS ORDER. *Oil Gas J.* 53, 46-48 (1954) Aug. 30.

A summary of arguments voiced by oil and gas producers concerning the FPC's order regulating their activities. The legality of the order is being challenged and doubtless it will be some time before the situation is clarified. (see Mr. Kuykendalls article Gas Age, Aug. 12, 1954).

R. F. Bukacek

2. APPLIANCES

Air Conditioning

Mackey, C. O., and Gay, N. R. COOLING LOADS FROM SUNLIT GLASS AND WALL. *Heating, Piping and Air Conditioning*, 26, 123-128 (1954) August.

This is a continuation of a study of the relation between cooling load and the instantaneous rate of heat gain from solar radiation. Previous results confirmed the accuracy of a hydraulic analogue in solving complex problems of heat transfer in the study of cooling loads, and such a device has been employed in arriving at the results of this paper. The prototype is a room assumed to be one of many in a multi-story office building, and the only source of heat gain is assumed to be from sunlit glass and sunlit wall facing south. The construction of the model analogue is described in some detail.

Authors' Abstract

Yeary, W. R. YEAR-ROUND AIR CONDITIONING. *Heating and Ventilating*, 51, 88-;02 (1954) June.

The problem of converting existing heating systems to summer cooling is taken up from the aspect of the heating contractor. The method of making surveys of prospect's homes to determine the capacity of existing ducts and fans, the air circulation, pump sizing, and control circuits are also covered. The article is good reference material for heating contractors who wish to develop business in air conditioning.

R. T. Ellington

Appliance Venting

Adams, E. C. APARTMENT HOUSE HEATING PROBLEMS SOLVED BY MULTI-STORY VENTS. *Gas*, 30, 68, 69 (1954) Sept.; *Gas Age*, 114, 55, 76 (1954) July.

Research work done for the U.S. Housing and Home Finance Agency revealed that considerable savings could be made in the construction of large multi-story apartment buildings designed to provide low-cost housing for families moved from substandard housing, if large central heating plants were replaced by individual apartment heating units fired with natural gas. Thus, the problem of multi-story venting of the many small heating plants was introduced. Actual construction of such a venting system was accomplished and the resulting investigations reveal that: (1) the amount of heat in the combustion products is important, (2) the conservation of this heat is vital, and (3) adequate insulation in the flue passage spaces can effectively produce the desired results. Another important design feature is the prevention of back-draft into one apartment from another. In the experimental installation, the rise in the individual vent connectors was designed to be sufficient to insure positive discharge into the main stack without the aid of any of the draft from the latter. This work is important both to the reduction of construction costs of this type of building, and the marketing of gas appliances and gas. Publisher's Abstract

Clothes Dryers

Clark, W. W. WITH THE CLOTHES DRYER THE PROBLEM IS TWO-FOLD: SELL THE DRYER AND SELL THE FUEL. *Butane-Propane News*, 16, 40-44 (1954) May.

The many advantages of the gas clothes dryer over natural drying (and electric drying) are discussed from the standpoint of overcoming the sales resistance of the customer. Surveys among the owners of the 900,000 dryers now in use have provided statistics which will aid in selling. O. P. Brysch

Fuel Comparison

Turner, C. C. BULLETIN 1073 SHOULD BE KILLED. *LP-Gas*, 14, 37, 38, 111-12 (1954) June.

This article goes into some of the test conditions imposed on gas appliances at Beltsville and shows how they biased results in favor of electric appliances. Again the question is raised of why the Department of Agriculture agency should make such biased tests and why the results so obtained should not be kept from publication. R. T. Ellington

Heat Pump

VALUE OF ARCTIC HEAT PUMP PROVEN IN COLD REGION TEST. *Industrial Control News* (Minneapolis-Honeywell Regulator Co.) 3, No. 2 (1954) August- September.

This heat pump produces ice and uses the latent heat effect at 32° as a heat source. The unit is diesel powered and also recovers heat from the cooling water with a resultant overall thermal efficiency well above that of the oil-fired heaters replaced. R. T. Ellington

Ironer

Myers, W. E. (assigned to The American Laundry Machinery Co.) GAS HEATED ROLL TYPE IRONER. U. S. 2,684,544 (1954) July 27.

The patent relates to an internally direct-fired laundry roll. The heated roll is open-ended and is claimed to secure proper secondary aeration without the use of a blower. Two of the claims also duplicate the burner disclosure made by W. M. Dow, *Journal Applied Mechanics*, December 1950. R. T. Ellington

Refrigeration

Anderson, P. P. (assigned to Servel, Inc.) TWO-PRESSURE ABSORPTION REFRIGERATION SYSTEM. U. S. 2,685,782 (1954) August 10.

This patent relates to the Servel lithium bro-

mide-water refrigeration method and provides for locating the evaporator below the absorber in a two-pressure system. J. F. Reed

Spencer, E. STEAM VACUUM REFRIGERATION. *Heating, Piping and Air Conditioning*, **26**, 104-107 (1954) August.

The principle of operation, performance, operating costs, selection of equipment and uses of steam vacuum refrigeration are discussed in the first of two articles. J. F. Reed

Spencer, E. STEAM VACUUM REFRIGERATION. *Heating, Piping and Air Conditioning*, **26**, 96-98 (1954) September.

This is the second of two articles on this subject. This article is concerned with piping considerations, controls, and capacities.
J. F. Reed

Water Heating

Bartlett, C. E. REVOLUTION AND REVENUE IN LAUNDRY. *Gas Age*, **114**, 49-51, 80, 82 (1954) August 12.

Once again the dominating advantages of gas water heaters over electric are brought out, along with the great market potentialities. To meet the requirements of modern automatic washers a minimum storage of 30 gal, a minimum top temperature setting of 160°, and an input of at least 35,000 btu/hr. are necessary. Spaced washings, warm-water soil removing cycles and electric boaster heaters built into the water are all admissions that electric water heaters and some gas heaters cannot do the job. These facts should be capitalized on by the gas industry. R. T. Ellington

HOW MUCH HOT WATER IN AVERAGE HOME? *Gas Age*, **114**, 16, 50-51 (1954) July 1.

An analysis is presented, based on an eight-month test in an average home, of the uses and requirements for the various operations in the home. The test showed among other things an average use of 1850 gal per month and that with a 30-gal gas water-heater with a 36-gal recovery 8 loads of clothes could be washed in succession without running out of hot water.
R. E. Ellington

3. COMBUSTION AND INDUSTRIAL FURNACES

Air Pollution Research

Jenkins, V. N. RESEARCH PROGRAM OF SMOKE AND FUMES COMMITTEE. *Petroleum Eng.*, **26**, C19, 20, 22 (1954) August.

The steps necessary to complete the organization of the Smoke and Fumes Committee of the Division of Refining of the American Petroleum Institute are described. Two of the sponsored research projects are briefly reviewed and essential data are given on the others.
D. J. Dennison

Stanford Research Institute. THE SMOG PROBLEM IN LOS ANGELES COUNTY. 134 pp. (1954) January, Los Angeles Western Oil and Gas Assoc.

The studies of the Los Angeles smog problem by Stanford Research Institute since 1947 are appraised in this report. The great complexity of the problem is emphasized, and although progress has been made, some of the causative factors are as yet unknown. The primary effects of smog,—eye irritation, visibility reduction and crop damage, are discussed with relation to the possible polluting agent. Ozone concentrations of from 30 to 80 parts per hundred million of the atmosphere are found to be the highest in the world. These concentrations correlate closely with smog effects, and rise from zero at early morning to a peak near noon, thus suggesting a photochemical formation. Unsaturated hydrocarbons in the presence of ozone are shown to contribute to crop damage, but extensive studies of many other possible contaminants have fixed no particular agent as responsible for the other effects. Testing methods and summaries of materials emitted as air pollutants are discussed in detail. O. P. Brysch

Flue Gas Corrosion

Whittingham, G. THE CORROSIVE NATURE OF COMBUSTION GASES. *Corrosion Technology* (British) **1**, 182-187, 193 (1954) August.

Investigations on corrosion by flue gases from solid fuel combustion are outlined. Effects of

different flue gas constituents on corrosion phenomena are discussed, also laboratory studies and some theoretical considerations of the effects of fuel type and burning rate on the sulfuric acid content of combustion gases from domestic appliances and pilot-scale equipment. Measurements of condensation characteristics of flue gases from water tube boilers, and various industrial boilers and furnaces are presented; investigations into the use of fuel additives are described briefly. D. J. Dennison

Heating Precision

Hess, F. O. THE INFLUENCE OF GASEOUS FUELS ON MODERN INDUSTRY. *Gas World* (British), Suppl. 25, 26, 28, 29 (1954) August 21.

This excellent paper presented at the World Power Conference in Rio de Janeiro is reprinted. The absolute dependence of modern industry on the controlled use of generated energy is ably illustrated. The precise control obtainable with a gas flame makes gas uniquely able to meet the requirements of modern industry. Since oil must be vaporized to burn, the precision required in heat application will call more and more for separation of the basic steps of generation of combustible gas and utilization of gas. The great importance of a pipeline from the Middle East to Europe in meeting future demands is brought out. R. T. Ellington

Industrial Air Conditioning

Salmon, J. E. AIR CONDITIONING AND REFRIGERATION FOR CANDY MANUFACTURING. *Heating and Ventilating*, 51, 82-92 (1954) July.

Many of the operations in candy making are critical as regards ambient temperature and humidity. An account is given of the basic operations in the production of chocolate, chocolate coating and dipping, bar candy, and hard candy, and the work in the starch department, hot rooms, cold rooms, cooling tunnels, coating kettles or pans, packing rooms and storage. The critical points in each are discussed and humidity and temperature usually used for each is given. R. T. Ellington

Metals Heating

AGA. Metals Industrial Subcom. PRODUCTION AND HOT WORKING OF TITANIUM. *Ind. Heating*, 21, 1551, 52, 54 (1954) August.

AGA. Industrial Newsletter No. 62 is presented in condensed form. R. T. Ellington

Hepburn, W. M. ANNEALING STEEL AND BRASS SHELL CASES. *Ind. Heating*, 21, 1496-98, 1500, 02, 04, 08, 1672, 74 (1954) August.

The application of direct-fired convection heated roller-hearth furnaces to the many annealing operations in brass and steel shell-case manufacture is described. Six annealing and one stress-relieving operation in drawing 90 mm. shell cases from either steel or brass, and the changeover from one material to the other can be made with a minimum of trouble.
R. E. Ellington

Marsh, K. HEAT TRANSFER TO ALUMINUM: PARTS 1, 2, 3 and 4. *Ind. Heating*, 21, 658-60, 662, 664, 666, 804, April; 898, 900, 902, 904, 906, 908, 910, May; 1120, 1122-24, 26, 28, 30, 1132, June; 1510-12, 1514 (1954) August.

In the first part the author takes up convective transfer only and evaluation of the convection transfer coefficient in the exponential expression resulting from integration of the heat balance about the object being heated. The apparent convection coefficient determined experimentally agreed closely with the calculated value. Part 2 discusses the transfer by radiation alone and gives the experimentally evaluated apparent radiation transfer coefficients for a number of different sized objects with varying surface conditions. Part 3 takes up the effect of various emissivities on the heating rate, and presents a series of time-temperature curves illustrating the effect. The relatively small proportion of radiant transfer due to the low emissivity of aluminum is clearly brought out. The concluding installment gives additional explanation of the exponential equation as semi-log graphs, and data secured from its use.
R. T. Ellington

Stack Dusts

Haines, G. F., Jr., and Hemeon, W. C. A NEW METHOD FOR DUST SAMPLING. Amer.

Soc. Mech. Eng. Paper 54-SA-74 (1954) June 22.

For common stack dusts, sampling efficiencies near 100% are obtained for multiple sampling nozzles in manifold arrangement, if the size of gas sample is calculated on the basis of approach velocity. The use of a baffle on the flue wall where high concentrations of dust may occur is necessary to insure complete sampling. For fine dusts, a net error can be expected where there is extreme distortion of the distribution of the dust. D. J. Dennison

Hemeon, W. C., and Haines, G. F., Jr. THE MAGNITUDE OF ERRORS IN STACK DUST SAMPLING. Am. Soc. Mech. Eng. Paper 54-SA-73, Pittsburgh (1954) June 22.

The effects of nozzle and filter design, nozzle size, nozzle and stack gas velocity and departure from isokinetic sampling conditions are considered. It is shown that for a mixture of both coarse and fine particles, the net error is materially lower when results are calculated on the basis of stack velocity; for fume-like particles, conventional calculations based on nozzle velocity are superior. A valuable application of the results is the simplification of the sampling process over the cross-section of the stack or flue. D. J. Dennison

4. CARBONIZATION AND GASIFICATION

Coal Sulfur Reactions

Terres, E. UEBER REAKTIONEN DES BRENNSTOFFSCHWEFELS BEI DEN ENT- UND VERGASUNGS-VORGAENGEN. (ON THE REACTIONS OF FUEL SULFUR DURING THE DEVOLATILIZATION AND GASIFICATION PROCESSES). *Brennstoff-Chemie* (German), 35, 225-31 (1954) August 18.

Reactions of the sulfur compounds occurring in coal are reviewed in considerable detail. Behavior under various temperature and gas-atmosphere conditions during carbonization and gasification is discussed, and data on reactions of inorganic sulfates and sulfides and their reduction by carbon and hydrogen are presented graphically. O. P. Brysch

Coke Oven Characteristics

Farafanow, W. MODERN COKE OVENS: THEIR CLASSIFICATION AND CERTAIN TECHNOLOGICAL CHARACTERISTICS. *Gas World* (British) 140, *Suppl.* 35-44, 46 (1954) August 7.

Following a brief historical review and industry survey, the author classifies the 14 principal designs of present-day coke ovens according to engineering features. The heating system and waste-heat regenerator arrangement are used as the principal features for classification, with subdivisions according to unidirectional and two-directional flow, and these are subclassified by type of fuel-gases and by air distribution. The designs are diagrammed, and the descriptions summarized in tables. Prospects for improvement in present systems and in new types of processes are mentioned. References to 46 book, journal and company publications are cited. O. P. Brysch

Complete Gasification

Kalbach, John C. (assigned to Hydrocarbon Research, Inc.) GASIFICATION OF CARBONACEOUS SOLIDS TO HYDROGEN-RICH GAS AND FUEL GAS. U. S. 2,687,950 (1954) August 31.

The patent refers to a process for methane and synthesis gas production whereby carbonaceous solids are first devolatilized by recycled hot gases at 100-800 psig and then gasified by oxygen-steam at 1400°-2100°F. The methane formed in the devolatization step is separated from the synthesis gas by low temperature fractionation. C. G. von Fredersdorff

Spaggiari, M. A., Gagnaire, L. and Hubmann, O. TOTAL GASIFICATION: CONTINENTAL DEVELOPMENTS. *Gas World* (British), 139, 1443, 1448 (1954) May 29.

This is a summary discussion of three papers on complete gasification where the interest is directed to the Integral Gas installations in Rome, Italy, a large coal-fired producer at the Schneider-Creusot works in France, and various powdered coal processes including the Panindco, Winkler, Flesch-Demag, Koppers-Totzek, Otto slagging furnace and the Ruhrgas cyclone gasifier. C. G. von Fredersdorff

Fluidized Gasification

Atwell, H. V. (assigned to The Texas Company) GASIFICATION OF CARBONACEOUS SOLIDS. U. S. 2,680,065 (1954) June 1.

A process is suggested for the gasification of pulverized carbonaceous material in a dense-phase fluidized bed by reaction with steam, the improvement of which consists of separating the entrained partly gasified carbon particles from the producer gas stream, burning the collected residues in a separate chamber and passing the hot combustion gases in indirect heat exchange with the fluid gasification vessel.

C. G. von Fredersdorff

Dickinson, N. L. (assigned to The M. W. Kellogg Co.) METHOD FOR CONTROLLING THERMAL CONDITIONS IN A GASEOUS REACTION. U. S. 2,685,498 (1954) August 3.

This patent claims to control the temperatures of a gaseous reaction by cooling the hot reaction products and preheating the cold charge gas with finely divided inert solids or catalysts, which act as a heat carrier. The solids flow down a vertical column in the form of a fluidized bed countercurrent to the uprising charge gas. The preheated charge gas leaves the column through a separator and, with or without being further heated, passes into a separate reactor. The hot reaction products are cooled by the solids leaving the bottom of the column and the gas-solid mixture is introduced into the top part of the column, where the cooled gases are allowed to leave the column through a separator and the heated solids to flow downwards into the preheating zone of the column. The desired temperature control is achieved by regulating the solid and gas flow rates coupled with, whenever necessary, cooling the solids at the bottom of the column or heating the charge gas prior to its entry into the reactor. The process is continuous and is most useful for the pyrolysis of light hydrocarbons. S. Hu

Odell, W. W. PROCESS OF PROMOTING CHEMICAL REACTIONS. U. S. 2,686,113 (1954) August 10.

The patent outlines a method of gasifying pulverized coal in suspended form in oxygen and steam by passing the reacting mixture through a substantially stationary or partly fluidized bed of preferably noncarbonaceous solids which act; a) as a filter to retain the carbon particles a preferentially longer time in contact with the reaction gases, thereby improving the gasification efficiency, and b) as a heat transfer medium to permit a cyclic operation with alternate air oxidation and steam gasification.

C. G. von Fredersdorff

Lignite Coke

Franke, N. W. (assigned to Gulf Research and Development Co.) PRODUCTION OF HIGH QUALITY LUMP COKE FROM LIGNITIC COALS. U. S. 2,686,152 (1954) August 10.

Lignitic coals, classed as non-coking coals, are subjected to a solvent extraction under pressure, at 480° to 900° F., by a solvent (½ to 2 parts) consisting of polynuclear aromatic compounds, their hydrogenated products and their mixtures (1:1 to 5:1) with phenols, in the presence of available hydrogen. The entire reaction mixture is distilled to recover solvent, and the extract-residue mixture is coked (avoiding foaming) up to 1800° F., to recover valuable tars and oils (45%) and dense coherent coke (35-40%). O. P. Brysch

Methane Synthesis

Johnson, W. B. (assigned to The M. W. Kellogg Co.) SYNTHESIS OF METHANE. U. S. 2,686,819 (1954) August 17.

Methane is synthesized from carbon monoxide (from producer gas) and steam. Finely divided iron in a fluidized state is oxidized with steam, the oxide is then carbided with carbon monoxide and the carbide is reduced with hydrogen forming methane and the free metal.

E. J. Pyrcioch

Rochdale Process

DEVELOPING THE "ROCHDALE" PROCESS. *Gas World* (British), 140, 320, 321 (1954) August 7.

This process, now in commercial operation at the Partington gas works near Manchester, England, is a method for speeding up carbonization of coal in vertical retorts by injecting additional gas at the base of the retort during the carbonization period. A blend of coal gas and blue water gas may be used for injection. Use of this gas increases the heating rate within

the retorts and thus halves the time required for carbonization. In addition to doubling the plant capacity, the quality of the coke is improved and the plant thermal efficiency is increased. (See *Gas Abs.* **10**, 103, 120)

E. J. Pyrcioch

Slagging Producer

Danulat, F. W. (assigned to Metallgesellschaft Aktiengesellschaft) APPARATUS AND A PROCESS FOR TAPPING LIQUID SLAG FROM PRESSURE GAS PRODUCERS. U. S. 2,687,347 (1954) August 24.

A slag tapping device is outlined comprising a water-cooled tube extending through the furnace wall, coupled with an injection chamber which mixes cooling fluids with the slag before flowing to a receiving container or to the open atmosphere. The slag tap is closed by a conical plug and the flow of slag can be regulated by the quantity of injection fluid introduced.

C. G. von Fredersdorff

Underground Gasification

Delaroziere, F. GAZEIFICATIONS SOUTERRAINE ET GAZEIFICATION INTEGRALE (UNDERGROUND GASIFICATION AND INTEGRAL GASIFICATION). *J Usines Gaz* (French), 78, 297-302 (1954) August.

A summary is given of underground gasification systems including radial borehole percolation, parallel gallery, electrolinking and hydrofracture techniques. Integral or total gasification methods such as the Flesch-Winkler fluidization process, the Kaiser combination distillation-gasification scheme and various powdered coal dilute-phase gasification processes are reviewed.

C. G. von Fredersdorff

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Cleaning Pipe Lines

McClure, C. WATER-DETERGENT METHOD FOR CLEANING PIPE LINES. *Petroleum Eng.*, **26**, D14, 17, 19, 21, 24 (1954) August.

The pigging of pipelines to increase the flow efficiency is a known standard procedure. The use of water and a detergent to increase removal of oil and oxides from the surface of the pipelines has been advocated for some time, but the fear that water left in the lines after cleaning would cause freeze-ups in cold weather has retarded industry-wide acceptance of this method. The El Paso Natural Gas Co. reports a maximum flow efficiency increase per cleaning dollar with a minimum shut down time for this method when used on lines not equipped for in-line pigging, and claims no freeze-up attributable to remaining water when the outlined procedures are used.

B. E. Eakin

Communications

HOW MICROWAVE SERVES TEXAS-ILLINOIS *Gas Age* **114**, 38-40 (1954) August 26.

A description of Texas-Illinois Natural Gas Pipe line Company's use of microwave equipment over 1400 miles of line.

R. F. Bukacek

Compressor Bearings

BEARINGS, LUBRICANTS, AND LUBRICATION. *Mech. Eng.*, **76**, 739-747 (1954) September.

A review of the 1953 literature on bearings, lubricants and lubrication is presented. One hundred thirty-six references are included in a bibliography.

D. V. Kniebes

Dehydration Control

Bird, J. R. OPERATING EXPERIENCE WITH THE BUREAU OF MINES DEW POINT RECORDER. 1. GENERAL CONSIDERATIONS ON INSTALLATION AND CALIBRATION. *Gas*, **30**, 118-20 (1954) September.

A large natural gas pipeline company presents its experience with the use of 25 Bureau of Mines hygrometer-actuated, dew point recorders. Their installations are described and some of the safety precautions taken are mentioned. The author presents a table useful for the selection of a sensing element so that the recorder chart has a high range limit well above that required to register some predetermined maximum limit. Many of the operation characteristics of the instrument are discussed.

Publisher's Abstract

Yauger, W. L. 2. THE DEW POINT RECORDER IN DEHYDRATION PLANT OPERATION. *Gas*, 30, 120-23 (1954) September.

New pipeline construction resulted in the necessity of putting 25 dehydration units in 11 locations into operation. Crews available were inexperienced, yet the dehydration plant throughput was high, so the need for an accurate and rapid method of determining dew points was necessary. The use of the Bureau of Mines type dew point recorder under these conditions is then described in the article. Schematic diagrams of typical dehydration stations and their instruments are shown. Several charts from actual operations are reproduced and the author interprets each and tells of the corrective matters required. The recorder does nothing that cannot be done with a conventional instrument, but the experience has proven that the continuous recording is desirable.

Publisher's Abstract

Distribution Systems

Rohret, L. C. ECONOMICAL CAPACITY INCREASES FOR LOW PRESSURE SYSTEMS. *Amer. Gas J.*, 181, 18, 19 (1954) August.

The change-over of a manufactured gas system to natural gas with the resulting increase in load has severely taxed some systems beyond their ability to provide adequate service. To meet the peak-load demand, certain systems have been converted from low pressure to regulated low pressure. This plan involves the lowest capital investment for the increase in capacity obtained, provides for the greatest load expansion, holds unaccounted-for gas at a minimum, permits 100% utilization of existing facilities, and requires only a normal maintenance program. Regulated low pressure consists of a house regulator on every service, with no change in the existing operating pressure except to meet peak conditions. To meet peaks, the district regulators increase the downstream pressure; when demand returns to normal, the regulators reduce the distribution pressure to the 6″ or 8″ w.c. formerly maintained. The hazards of accidental over-pressuring a system are also reduced by this system. B. E. Eakin

Dust Removal

Hutchinson, A. J., Fish, R. C., and Hall, P. (assigned to The Fish Engineering Corp.) VARIABLE CAPACITY DUST REMOVER SCRUBBER. U. S. 2,687,184 (1954) August 24.

The patent describes an oil-bath type dust scrubber wherein the contact area and amount of oil can be increased with increasing gas flow, thereby increasing the efficiency at higher gas rates. W. G. Bair

Culhane, F. R. GAS CLEANING APPARATUS. U. S. 2,687,780 (1954) August 31.

This invention relates to the purifying of air and other gases with an apparatus which is used for removing dust or other particulate matter from a moving stream of gas, by causing the particulate matter to become entrained in a liquid disposed in contact with the stream of gas. S. Volchko

Gas Meters

Resko, P. V. METER STANDARDIZATION IS VITAL. *Gas Age*, 114, 40-1 (1954) August 12.

The author pleads for the Gas Industry to cooperate in meter standardization. He states that almost every other branch of industry,—for instance, machine trades, railroads, electrical products, have agreed on standards, but that gas meter manufacture is cluttered with myriads of special designs. Standardization would result in minimization of inventories, cutting of operating costs and meter prices, and is prerequisite to economic survival, it is asserted. The author asks for industry-wide support of an AGA-directed program of standardization, and pledges the backing of his own company.

E. B. Shultz

Hydrogen Separation

Kassel, L. S. (assigned to Universal Oil Products Co.) METHOD FOR CONCENTRATING HYDROGEN. U.S. 2,685,941 (1954) August 10.

Purified hydrogen is produced from a hydrogen and low-molecular-weight hydrocarbon mixture by absorbing the hydrocarbons with a liquid hydrocarbon absorbent under a pressure of from 1000 to 5000 psia. E. J. Pyrcioch

Loads and Design

Pugh, J. J. FORECASTING ADEQUACY OF DISTRIBUTION. *Gas Age*, 114, 42-45, 77-79 (1954) August 12.

A method of forecasting the adequacy of natu-

ral gas distribution systems to supply potential heating loads is outlined based on three parameters. The Customer Use Ratio is the relation of the daily customer use to temperature, and is determined by dividing the daily use per customer in an area on a 30°F day by the daily use for a 50°F mean temperature day. The peak hour demand in an area is expressed as a percent of daily sendout and is called the Per Cent Peak Hour; its relation to temperature being determined from firm gas sendout records. Also needed is one set or more of observed pressure drop data at a given temperature. From these relations, and the charts presented, it is possible to determine the pressure drop that can be expected to occur in the system under any given load as a function of temperature. The method is applicable to high or low pressure systems, and the procedure of calculation is outlined.

B. E. Eakin

LP-Gas Storage

Bergstrom, E. V. (assigned to Socony-Vacuum Oil Co., Incorp.) SAFETY STORAGE SYSTEM FOR LIQUEFIED HYDROCARBONS. U. S. 2,687,618 (1954) August 31.

The patent describes a storage vessel for liquified petroleum gases which provides for a submergence under water to reduce the fire hazard.

W. G. Bair

Counts, E. H., and Childress, C. L. SINCLAIR COMPLETING PROJECT FOR UNDERGROUND L.P.G. STORAGE. *Oil Gas J.*, 53, 73-74 (1954) August.

Sinclair has recently completed construction on a 5,000,000 gal. LPG storage pool which was mined out of blue shale at a 308 ft. depth. Storage pressure is expected to be 90 psig.

W. G. Bair

Kroeger, C. V. LP-GAS GOES UNDERGROUND FOR STORAGE. *Gas Age*, 114, 17-21; 61-62 (1954) August 26.

The picture of underground storage of LP-gas is discussed in a manner of interest to the distributing company. Previous articles have emphasized the problems and advantages to producers and shippers. Six methods of underground storage for peak-shaving use are presented with the economics of each. J. M. Reid

LP-Gas Transport

Abell, C. IMPROVED TRANSPORT DESIGN INCREASES OPERATING PROFITS. *Butane-Propane News*, 16, 33-7 (1954) August.

A general discussion of recent design changes in LP-gas transport trucks. These changes make increased payloads possible in proportion to the reduced weight of the carrier, within the usual axle-load limits allowed in the several States. W. G. Bair

Oil Fogger

Lusby, O. W. (assigned to Consolidated Gas Electric Light and Power Co.) METHOD AND APPARATUS FOR PRODUCING OIL FOG IN GAS MAINS. U. S. 2,686,112 (1954) August 1.

A method for producing oil fog is described which consists of leading off a portion of the main gas stream, heating it, and passing the heated gas up through a contacting tower where it meets a spray of oil. The hot gas and oil vapor is then returned to the main stream where it is chilled, causing condensation and the formation of a stable oil fog, it is claimed. The patent shows two tower designs, one being a packed column with oil passing countercurrently to gas, the other being a partially packed column with concurrent flow. E. B. Shultz

Oxide Purifiers

Mills, C. E. THE HANDLING OF PURIFYING MATERIALS. *Gas Times* (British), 80, 304, 306, 308 (1954) September 3.

Equipment and operating practice is described for the handling of oxide in purifier installations in six gas plants (400 to 24,000 MCF/day) in the Sheffield area. O. P. Brysch

Pipe Line Protection

Daratt, Joseph P. ELECTRICAL EFFECTS ON UNDERGROUND PIPELINES. *Gas*, 30, 124, 126 (1954) September.

Part 5 of an article of 5 installments tells of the induced a-c current in steel piping paralleling distribution wires of an electric utility and how insulating flanges located where the gas line moves away from the electrical services protect the remainder of the line from stray current.

The author feels that personnel and insulated joints should be protected where a gas line runs along a high tension line. Ways of providing this protection are covered, and the author states his preference as to frequency and type of insulating joints. Publisher's Abstract

Richard, C. PERFORMANCE OF LIGHTNING ARRESTERS FOR INSULATING JOINTS. *Gas*, 30, 104, 106 (1954) August.

Part 3 of a series of 5 installments on insulating joints in long pipelines deals with the prevention of damage to insulated joints in buried pipelines by lightning and power faults currents. Frequent short-circuiting of insulated joints is largely eliminated by the installation of air-gap arresters across each joint. The relationship of the number of insulating joint failures to the effective resistance of pipe failures is pointed out. Cooperation has been shown by electric companies in grounding transmission towers in a manner to minimize damage to pipelines. Publisher's Abstract

Pipe Line Testing

Powell, J. S. and Senatoroff, N. K. HYDROSTATIC TESTING OF LARGE GAS PIPELINES. *Oil Gas J.*, 53, 132-36 (1954) August 23.

Proper hydrostatic testing procedure is discussed, and the advisability of advance planning for this testing method, before the line is constructed, is emphasized. Little chance for hydrate formation will exist if proper care is used in removing test water by rubber-cup pigging and if adequately dehydrated gas is used for line pressuring. Four designs for pig traps are shown and it is urged that these be provided for as a permanent feature of any line. Special techniques for eliminating entrained air, removing water and drying the line (to about 0.02 lb water per square foot of pipe-wall area) are considered. An equation which gives the distance of pig travel after breaking free from an obstruction is presented without derivation. Costs of hydrostatic testing have been reported from 10 to 50 cents per foot of large-diameter pipelines. The authors believe that adequate planning will prevent any delay in completion of the line due to this method of testing.

E. B. Shultz

Pipe Stress Research

Abraham, E. D., and McClure, G. M. HOW STRESSES ARE AFFECTED BY BRANCH CONNECTIONS. *Pipe Line Industry*, 1, 60, 62-4 (1954) September.

Progress of research on stresses in unreinforced pipe line branch connections at Battelle Memorial Institute is reported. This includes field tests by strain gaging before and after cutting branches on a 26-in. line; and laboratory tests with similar gaging on constructed joints with and without bending loads. Results summarizing the stresses and distortions are diagrammed and discussed. This work forms a basis for continued research (sponsored by the American Gas Association) on reinforcements of branches. O. P. Brysch

Production

Bahke, E. GERMANS COME UP WITH NEW CANTILEVER DRILLING MAST. *World Oil*, 139, 143-145 (1954) August 1.

Featuring a tubular-steel type construction, a new mast designed to withstand 1.3 million-pound loads has been recently introduced. The mast is easy to assemble and transport, yet has maximum rigidity for absorbing shock loads. Outstanding features include: smallest transport volume for a maximum load capacity, low resistance of structure to wind, light weight, 40% less surface area resulting in reduced corrosion attack, built-in ladders, electric wiring and mud piping, adjustable pipe rack, and quick and easy assembly and raising. The mast provides excellent visibility, and clearance, and an 8000-foot well was drilled recently near Hanover, Germany, with the mast with excellent results. B. E. Eakin

Deegan, C. J. DO YOU KNOW HOW TO FIGURE WHEN PRESSURE MAINTENANCE PAYS OFF? *Oil Gas J.*, 53, 100-102 (1954) August 2.

Pressure maintenance, either by gas or water injection provides an economical method of secondary recovery. A method of computing the market value of the property under various pressure maintenance programs is presented. A quick check can be based on the idea that the proper investment in pressure maintenance

should develop proved reserves with a market value per barrel at least equal to similar reserves developed by drilling on proved locations. If the market value per barrel of total proved reserves is about the same in the unit as in primary producing properties in the same district, the investment is probably about right. An example shows how a small operator might compare the investments in a purely theoretical project, where there are two alternative proposals. B. E. Eakin

Reardon, E. E. GAS AND CONDENSATE. *Petroleum Eng.*, 26, B47, 50, 52 Ref. Annual (1954) July 15.

Production from a retrograde condensate reservoir from an off-shore location results in some specialized practices. Due to the high cost of developing off-shore production, reserves and the rate of production must be much higher per well to pay out, than for a land-based site. The fire prevention and safety practice costs are also increased. B. E. Eakin

Rodgers, J. K. and Tracht, J. (assigned to Gulf Research & Development Co.) SYSTEM FOR THE REMOVAL OF CORROSIVE FLUIDS FROM GAS WELLS. U. S. 2,688,368 (1954) September 7.

In this invention corrosion of gas wells of the wet gas and condensate type is prevented by introduction of an aliphatic amine, preferably mono-, di- or tri-ethanolamine, and a glycol, preferably di-ethylene glycol, into the annulus of the well, where it mixes with the well fluid and returns to the surface through the flow tubing. The amine combines with CO_2 and H_2S, and the glycol absorbs water producing a substantially non-corrosive fluid. The amine and glycol are separated and regenerated.
D. M. Mason

Sulfur Recovery

Conroy, E. H., Jr. and Haines, H. W., Jr. (assigned to Texas Gulf Sulphur Co.) CYCLIC METHOD FOR CONDENSING SULFUR VAPOR. U. S. 2,687,344 (1954) August 24.

Sulfur vapor carried in non-condensable gases is condensed by spraying liquid sulfur through a jet condenser into the gas, then separating the sulfur from the stream in a cyclone or centrifugal separator. The collected liquid sulfur is cooled by a similar step in which it is sprayed into cold air. Temperature of the sulfur is maintained between about 120° C, slightly above the liquefaction temperature of sulfur, and 150° C., slightly below the temperature at which sulfur becomes viscous, by controlling the amount and temperature of the sprayed sulfur. D. M. Mason

Garwood, W. E. (assigned to Socony-Vacuum Oil Co.) CATALYTIC DESULFURIZATION OF HYDROCARBONS. U. S. 2,687,983 (1954) August 31.

In the catalytic desulfurization of hydrocarbons, chromia-alumina cogelled composites which have been subjected to pretreatment first with hydrogen and then with hydrogen sulfide are found to possess improved catalyst life, and to lead to a reduction in coke formation and overcome disadvantages inherent with the previously employed catalysts for hydrosulfurization.
D. M. Mason

Graff, R. A. FITTING SULFUR RECOVERY INTO GASOLINE PLANTS. *Oil Gas J.*, 53, 130-131 (1954) August.

For the sulfur-recovery plant in the low capacity range of 5 to 30 long tons per day, economical operation requires that the plant operate with a minimum of labor, and that it be integrated in operation with other process units of the gasoline plant area. Methods and advantages of integration are discussed.
D. M. Mason

Turbine Compressors

Park, T. S., Jr. THE COMBUSTION GAS TURBINE. *Gas*, 30, 93-97 (1954) July.

Turbine and reciprocating engines as power sources are compared on a number of points. The characteristics of reciprocating and turbo compressors are superimposed on a pipeline operating curve, and the method of operating with each is described. Operating costs are discussed including the full-load combustion-turbine fuel consumption of 81 MCF of 1000 Btu gas per horsepower per year and the report of actual operating expenses including fuel on a typical 15000 hp. gas turbine station of $8.25 per horsepower per year. R. T. Ellington

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Fischer-Tropsch

Gibson, E. J., and Hall, C. C. FISCHER-TROPSCH SYNTHESIS WITH COBALT CATALYSTS. II. THE EFFECT OF NITROGEN, CARBON DIOXIDE AND METHANE IN THE SYNTHESIS GAS. *J. Appl. Chem.*, 4, 464-68 (1954) August.

In the Fischer-Tropsch synthesis at atmospheric pressure in the presence of a cobalt catalyst, the rate of conversion of carbon monoxide and hydrogen is reduced by the addition of diluents to the synthesis gas. The fall in reaction rate has been shown to be approximately directly proportional to the fall in concentration of the reactants. The proportion of gaseous to non-gaseous products increases with increasing dilution. For a fixed amount of diluent, the proportion of non-gaseous increases with change in the nature of the diluent in the order: nitrogen, methane, carbon dioxide.

Authors' Abstract

Kirshenbaum, I. and Kearby, K. K. (assigned to Standard Oil Development Co.) HYDROCARBON SYNTHESIS AND CATALYST THEREFOR. U. S. 2,686,196 (1954) August 10.

The patent claims an improved iron catalyst for the hydrocarbon synthesis process which is not subject to excessive distintegration and carbon deposition when used in fluid beds. The above is accomplished when the iron preferably in the form of its carbonate is combined with a metal carbonate base which in itself exhibits a high disintegration resistance and the composite then reduced. The metal carbonates of group II of the periodic system give the catalyst high activity, selectivity and extent life.

H. A. Dirksen

"Little Inch" to Oil?

"LITTLE INCH" SWITCH TO OIL IN LAP OF FPC. *Nat. Petroleum News* 46, 15-17 (1954) Sept. 8.

The conflicting interests involved in Texas Eastern Transmission Corporation proposed reconversion of the "Little Inch" line to oil products are cited with some of the factors involved.

R. F. Bukacek

Metal Removal

Porter, F. W. B. and Northcott, R. P. (assigned to Anglo-Iranian Oil Co., Ltd.) REMOVAL OF VANADIUM AND SODIUM FROM PETROLEUM HYDROCARBONS. U. S. 2,687,895 (1954) August 31.

In removal of sodium and vanadium from crude petroleum and crude residues by contacting with bauxite, the process is preferably conducted in two stages of differing conditions and in which only the vanadium removal stage requires presence of hydrogen.

D. M. Mason

Middle East Oil

Duff, D. M. IRANIAN OIL TO FLOW AGAIN. *Oil Gas J.*, 53, 80 (1954) August 9; INDUSTRY BRACED FOR RETURN OF IRAN OIL. *Nat. Petroleum News*, 46, 13-16 (1954) August 11.

These two articles discuss the recent settlement of the 3-year-old Iranian oil problem. A group of British, Dutch and American companies will jointly form two companies to handle crude production and refining. Iran will pay $70,000,000 to Anglo-Iranian Oil Co. as compensation for losses due to nationalization of the industry. U. S. companies involved in the venture are optimistic. They feel that it will not upset markets since return of Iranian oil products will be gradual. Western diplomats hope the agreement means that Iran has decided against cooperation with Russia. The only losers from the settlement appear to be some other Middle Eastern countries whose oil production will be restrained temporarily.

E. B. Shultz

Petroleum Investment

Logan, L. J. OIL INVESTMENT SOON TO REACH $47 BILLION. *World Oil*, 139 84-85 (1954) August 1.

By the end of 1954 the petroleum industry will have in the U. S. a gross investment of over $47 billion. That amount will include the $4 billion of capital expenditures being made this year. At the middle of this year the industry's investment in the U. S. stood at about $45 billion. Some years ago, through its vigorous postwar expansion, petroleum became the third largest industry of the U. S. in terms of investment or assets. It now is not far short of second place.

Author's Abstract

Pipe Line

"UNUSUAL" DESCRIBES ALCANGO PIPE LINE. *Petroleum Eng.* 26, D59, D62, D64 (1954) September.

The Alcango pipe line is an 8" line, 625 miles long, from Haines to Fairbanks, Alaska. The terrain, weather conditions and military specifications made this one of the toughest pipe line jobs to date. W. G. Bair

Shale-Oil Extraction

Findlay, R. A. (assigned to Phillips Petroleum Co.) OIL EXTRACTION FROM SHALE. U. S. 2,685,555 (1954) August 3.

This method of extracting oil from crushed shale requires the preparation of a crushed shale-refractory oil slurry, which is passed downwardly through a bubble-tray column countercurrent to a flow of hot refractory oil vapors. As the slurry moves downward, its temperature is gradually increased resulting in vaporization of recoverable oils. These vapors are taken off at several points along the column, and are condensed and recovered. Spent shale is used as a fuel to heat the refractory oil. A claimed advantage of the process resides in the gradual heating combined with a solvent extraction effect produced by recycling of refractory oil. Operating pressures range up to 300 psi, and highest temperatures range between 700 and 900° F. E. B. Shultz

Tar Cracking

Kalinowski, B. and Grossman, A. TERMICZNA PRZEROBKA SMOLY GENERATOROWEJ W KOMORACH KOKSOWNICZYCH. (THERMAL CONVERSION OF GENERATOR TAR IN COKE-OVEN CHAMBERS.) *Przemysl Chemiczny* (Polish) 10, 316-320 (1954) June.

A thermic method of converting generator tar (700°-800° C.) into coke tar by introducing it with the coal charge into a coke chamber (at 1000° C.) has been worked out. Experiments on technical scale have been described. The method does not require new investments, is economic, and is advantageous from the point of view of utilization of raw materials and of the quality of the coke obtained.

Authors' Abstract

7. ANALYTICAL METHODS AND TESTS

Air Sampling

Dieringer, L. F. and Ingram, W. T. METHODS AND INSTRUMENTATION FOR AIR SAMPLING. *Instruments and Automation*, 27, 1086-89 (1954) July.

Sampling techniques used in air-pollution analysis are discussed. Methods for particulate matter include sedimentation, filtration, impingement, and electrostatic and thermal precipitation; for gases,—absorption, adsorption, combustion, and freezing. Instruments used in each of the methods for collection and analysis of samples are described and illustrated.

D. J. Dennison

Coal Ash Analysis

Anderson, C. H. and Beatty, C. D. SPECTROGRAPHIC DETERMINATION OF SODIUM AND POTASSIUM IN COAL ASHES. *Anal. Chem.*, 26, 1369-71 (1954) August.

Certain interferences with the potassium and sodium determinations are eliminated. The time requirement for a determination is 1.5 hours. Results compare satisfactorily with those of chemical methods. D. J. Dennison

Frederick, W. J., White, J. A., and Biber, H. E. DETERMINATION OF GERMANIUM IN COAL, COAL ASH, AND FLUE DUST. *Anal. Chem.*, 26, 1328-30 (1954) August.

This investigation was undertaken to develop a rapid and accurate method for the determination of small amounts of germanium such as exist in coal and waste products. A chemical method is described in which the germanium is converted to Ca_2GeO_4, separated as germanium tetrachloride by distillation, and determined as cinchonine germanomolybdate. A spectrochemical method for coal and coal ash is also described, in which bismuth is added as an internal standard, and a direct current arc is used as the means of excitation. For small amounts of germanium, the spectrochemical method is more sensitive and also less time-consuming than the chemical method, after synthetic standards have been prepared and working curves established. Authors' Abstract

Belcher, R., Nutten, A. J. and Thomas, H. THE DETERMINATION OF POTASSIUM AND SODIUM IN COAL ASH. *Anal. Chim. Acta*, 11, 120-127 (1954) August.

Methods are described for the rapid determination of sodium and potassium in coal ash. The ash is decomposed by a Lawrence Smith ignition: sodium is determined as sodium zinc uranyl acetate (gravimetrically or titrimetrically) on an aliquot of the aqueous extract, and potassium is determined gravimetrically as potassium tetraphenyl-boron on a second aliquot. Other methods for completing the determination were examined but were less satisfactory. The flame photometer method although less reproducible than other methods is extremely rapid and is probably accurate enough for routine purposes. Authors' Abstract

Dust Sampling

Langston, B. and Stephens, F. M., Jr. COLLECTION OF LABORATORY DUSTS. *Mining Eng.*, 6, 833-836 (1954) August.

Although little information is available concerning small-scale equipment for dust collection in laboratories, it is possible to adapt standard equipment for laboratory use. Dust from laboratory processes may be collected by cyclone separators, filters, electrostatic separators, scrubbers, and settling chambers.

Authors' Abstract

Fly-Ash Size Testing

Holton, W. C. and Reynolds, D. F., Jr. A COMPARISON OF SIZE-CONSIST DETERMINATIONS OF DUPLICATE SAMPLES OF FLY ASH. *Combustion*, 26, 41-46 (1954) August.

Size-consist determinations were made by four independent laboratories on a total of eight duplicate samples of fly ash and the results were compared. This comparison showed that the maximum deviation from the average of the percentage undersize for the two samples analyzed by each laboratory was usually less than 10 percentage points. The terminal velocities calculated from the data reported showed a difference of about 25 percentage points between the limits in the amounts of material settled at any given terminal velocity. The variation in particle sizes was of the same order. It would be expected that the correlation of results obtained in a single laboratory, or those found by different laboratories analyzing duplicate samples, would be better than was reported. The lack of agreement indicates both the difficulty of the analytical methods and the need for better instrumentation in this field.

Authors' Abstract

Humidity Control

Strange, J. P., and Paulus, P. V. (assigned to Mine Safety Appliances Co.) METHOD AND APPARATUS FOR TESTING GAS. U. S. 2,687,342 (1954) August 24.

To eliminate the deleterious influence of varying humidity in the analysis of gases by thermal conductivity and other types of gas analyzing instruments, the gas is pretreated to ensure unvarying humidity by contacting it with solid polyvinyl alcohol. D. M. Mason

Infrared Spectrophotometers

Schaurmann, R. and Kendrick, E. ACCURATE ANALYSIS WITH AN INFRARED DOUBLE-BEAM SPECTROPHOTOMETER. *Anal. Chem.*, 26, 1263-69 (1954) August.

Xylene-ethylbenzene mixtures are used to examine the effect of instrumental factors on the analytical accuracy attainable with infrared spectrophotometers. The technique of difference spectra and averaging of at least 4 results give well within 1% accuracy. R. R. Amrine

Plant Waste Survey

Dennis, A. P., Jr. PLAN FOR SURVEYING REFINERY WASTE STREAMS. *Petroleum Eng.*, 26, C14-19 (1954) August; *Oil Gas J.*, 53, 110-14 (1954) August 16.

A plan for a survey of waste streams in a refinery is discussed, which is designed to yield an overall evaluation of plant waste including its major component flows and effect of different contaminants. Personnel, selection of analytical tests, development of sampling equipment, obtaining rate of flow data, and setting up a sampling schedule are discussed.

D. M. Mason

Sulfur in Oils

Granatelli, L. DETERMINATION OF SULFUR IN DRIP OILS—USE OF OXY-HYDROGEN BURNER. *Am. Chem. Soc.*, Div. Petro-

leum Chem., General Papers No. 32, 31-37 (1954) September 11-17.

The difficulties in obtaining complete combustion of drip oils by conventional methods have been circumvented by burning the sample in the flame of an oxy-hydrogen burner. The drip oil is aspirated through the burner directly into the oxy-hydrogen flame. Sulfur oxides formed are absorbed and oxidized to sulfuric acid in hydrogen peroxide solution and determined gravimetrically as barium sulfate. The method appears to be applicable to the determination of elemental sulfur in hydrocarbon mixtures.

D. M. Mason

McCoy, R. N., and Weiss, F. T. APPLICATION OF CATALYTIC DESULFURIZATION TO GROUP SULFUR ANALYSIS OF PETROLEUM FRACTIONS. *Am. Chem. Soc.*, Div. Petroleum Chem., General Papers No. 32, 21-29 (1954) September 11-17.

A method has been developed for differentiating between thiophenic and non-thiophenic sulfur compounds in petroleum fractions, based on the principle of differential thermodynamic stability. Catalytic decomposition of non-thiophenic sulfur compounds over heated alumina is employed to produce hydrogen sulfide, which provides a direct measure of the content of this sulfur type in the sample. A more complete group sulfur determination can be made by employing direct procedures for the determination of total sulfur, elemental sulfur, hydrogen sulfide, mercaptan and disulfide. Thiophenes are calculated by difference between total sulfur and non-thiophenic sulfur. D. M. Mason

8. GENERAL AND PHYSICAL CHEMISTRY

Carbon Properties

Phinney, F. S. GRAPHITIZATION OF DIAMOND. *Science*, 120, 393-4 (1954) September 3.

Graphitization of industrial diamond was carried out on maccles and powdered particles. Results show the former graphitized at temperatures below 1200° C, while the latter showed only superficial change at 1300° C. and only 1 to 2 percent change at 1400° C.

S. Mori

Walker, P. L., Jr., McKinstry, H. A., and Pustinger, J. V. X-RAY DIFFRACTION STUDIES ON CARBON GASIFICATION. *Ind. Eng. Chem.*, 46, 1651-1658 (1954) August.

Effect of the carbon gasification upon the *a* and the *c* axis of the crystalline structure determined by x-ray diffraction showed that the latter distance decreased. This was attributed to the decrease in the non-graphitic structure due to its preferential reaction in the process of gasification. Further studies on line broadening showed that the crystallite size for the *a* parameter decreased, thereby confirming the theory that gasification takes place at the crystal edges of the carbon. S. Mori

Carbon-Oxygen Reactions

Lewis, W. K., Gilliland, E. R. and R. R., Paxton. LOW-TEMPERATURE OXIDATION OF CARBON. *Ind. Eng. Chem.*, 46, 1327-1331 (1954) June.

In a fluidized powder system operating at 1.1 atmospheres total pressure, it was found that: a) both carbon monoxide and carbon dioxide were primary products of the low temperature oxidation of carbon, b) the production ratio, $CO/(CO+CO_2)$ was relatively independent of carbon type and temperature between 300-950° F, having an average value 0.24, which fraction increased as the oxygen partial pressure was reduced below 0.2 atmospheres, and c) the rate of carbon gasification per unit weight of fuel was proportional to the oxygen partial pressure.

C. G. von Fredersdorff

Flame Temperatures

Bauserman, G. W., Prien, C. H., and Zandstra, T. DETERMINATION OF TRANSIENT FLAME TEMPERATURES. *Rev. Sci. Instruments*, 25, 640-643 (1954) July.

An instrument to determine the temperatures of rapidly varying flames is described. This instrument uses a photoelectric modification of the line-reversal method, wherein the light beam from a temperature-variable incandescent source is split into two monochromatic beams by means of mirrors and filters to impinge upon 931A multiplier phototubes. The phototube signals are sent to a mubridge null detector, whose output is fed to an oscilloscope for photography of results. The instrument can detect

25° K temperature differences between about 1540° and 3100° K, and three millisecond time differences. Typical time-temperature results are given, along with the analytical procedures used. Authors' Abstract

Fuel Cells

Adams, A. M. FUEL CELLS. I. PRINCIPLES, EARLY FUEL CELLS, HIGH TEMPERATURE CELLS. *Chem. Process Eng.* (British) 35, 199-203 (1954) July.

A thermodynamic analysis shows that the more favorable oxidation reactions to produce reasonably high voltages in an electrolytic or fuel cell are those of calcium, aluminum, zinc, tin, carbon and hydrogen. Experiments with most of these elements as well as with sulfur dioxide have been conducted and no practical solution has yet been found. The hydrogen-oxygen cell suffers from complexity of construction, requiring perforated platinum electrodes covered with platinum black which is readily polarized. The electrolyte in this cell consisted of a dilute sulfuric acid solution held in an asbestos disc, and to decrease polarization effects, the electrodes had to be interchanged periodically. The oxidation of sulfur dioxide to the trioxide produces voltages which are too low, with correspondingly low thermal efficiencies. Since the fuel cell process should involve reactants which are either natural fuels or substances easily prepared by reduction with fuels, the oxidation reactions of zinc, calcium, aluminum and the like are unsuitable because these require preliminary extraction of the metals which can only be carried out with carbon at very high temperatures, resulting in high heat losses. This leaves the oxidation of carbon and its derivatives, carbon monoxide and water gas, as the most promising fuel cell raw materials. In the use of solid carbon directly, preliminary experiments have evolved a cell consisting of a granulated carbon anode enclosed in a cerium oxide-clay electrolyte which in turn was in contact with a granulated iron oxide cathode through which air was passed. When this cell was heated to 1100°C, the solid electrolyte became conductive and resulted in 0.70 volts on open circuit. Since the accumulation of ash represents a principal disadvantage in the carbon cell, later work was directed toward the application of fuel gases in this process. A typical high temperature cell using water gas was developed by Davtyan, who employed a $Fe\text{-}Fe_3O_4$ anode over which $CO+H_2$ was passed and a $Fe_2O_3\text{-}Fe_3O_4$ cathode over which air was passed, the electrodes being separated by a solid electrolyte operating at approximately 700°C.

C. G. von Fredersdorff

Adams, A. M. FUEL CELLS. II. LOW TEMPERATURE CELLS, FUTURE DEVELOPMENTS. *Chem. Process Eng.* (British), 35, 238-240 (1954) August.

In principle, the fuel cells using the oxidation of carbon reaction appear more economical than the recently developed hydrogen-oxygen cells, primarily because of the high purity requirements and the manufacturing cost of hydrogen. The former cell requires only the carbon reaction with steam at one electrode and the reduction of oxygen at the other and the exchange of electrons are facilitated by the redox process of the circulating cations in the electrolyte.

S. Mori

H_2S Oxidation

Satterfield, C. H., Reid, R. C. and Briggs, D. R. RATE OF OXIDATION OF HYDROGEN SULFIDE BY HYDROGEN PEROXIDE. *J. Am. Chem. Soc.*, 76, 3922-3925 (1954) August 5.

Studies of the rate of reaction of dilute aqueous solutions of hydrogen peroxide with hydrogen sulfide at temperatures from 24° to 61° C., and in the presence and absence of sulfuric acid are reported. D. M. Mason

Microwaves in Synthesis

McCarthy, R. L. CHEMICAL SYNTHESIS FROM FREE RADICALS PRODUCED IN MICROWAVE FIELDS. *J. Chem. Phys.*, 22, 1360-65 (1954) August.

Synthesis of nitric oxide and nitrogen dioxide from air, and acetylene from methane has been accomplished utilizing the reaction of free radicals produced in the starting material by microwave fields. D. V. Kniebes

Thermal Conductivities

Woolf, J. R. and Sibbitt, W. L. THERMAL CONDUCTIVITY OF LIQUIDS. *Ind. Eng. Chem.*, 46, 1947-1952 (1954) September.

The authors measured the thermal conductivity

of water, carbon tetrachloride, chloroform, glycerol, ethylene glycol, trichloroethylene, propylene glycol, olive oil, fin oil, Circo XXX heat transfer oil, Aroclor 1254, Aroclor 1248, Dowtherm A and Dowtherm E. The data was taken in a cylindrical cell at temperatures from 70° to 300°F. The results are compared with similar values reported in the literature.

R. E. Peck

9. ORGANIC CHEMISTRY

Acetone-Methane Pyrolysis

McNesby, J. R. and Gordon, A. S. THE PYROLYSIS AND PHOTOLYSIS OF ACETONE-d_6 IN THE PRESENCE OF METHANE. *J. Am. Chem. Soc.*, 76, 4196-98 (1954) August 20.

Mixtures of acetone-d_6 and methane were pyrolyzed in the range 475-525° and photolyzed in the temperature range 350-428°. The rate of reaction of CD_3 with CH_4 to form CD_3H relative to the rate of formation of CD_4 from CD_3 and acetone-d_6 was studied as a function of temperature. The activation energy for the reaction of CD_3 with methane to form CD_3H is 2.74 kcal./mole greater than for CD_3 with acetone-d_6 to form CD_4. From this value the activation energy for the abstraction of hydrogen from methane by CD_3 is shown to be 14.0 kcal./mole. It has been demonstrated that the CD_3H/CD_4 ratio is somewhat surface dependent; a sixfold increase in surface/volume ratio increases the CD_3H/CD_4 ratio by about 10%.

Authors' Abstract

Mercaptan Uses

NEW HORIZONS FOR METHYL MERCAPTAN. *Can. Chem. Processing*, 38, 58, 61, 62 (1954) August.

With new outlets developing in the plastics fields and in the synthesis of methionine, methyl mercaptan is advancing in commercial importance. Its uses, its recovery from petroleum fractions, its synthesis from carbon disulfide, and its synthesis from methanol and H_2S are reviewed.

D. M. Mason

Petrochemical Trends

Brooks, B. T. and Brien, E. B. NEW PHASE DEVELOPS IN PETROCHEMICALS. *Petroleum Eng.*, 26, C7-C10 (1954) September.

Many chemical industrialists are of the opinion that a saturation point in production and sales has been reached for many important petrochemicals, and is being approached for others. In some cases, recent price declines have been due to technological advances and in others due to overbuilding of capacity. At the same time the cost of raw material natural gas has increased considerably and this trend may be expected to continue. If product price declines are due to sharpened competition, or distress selling this situation may be corrected, but where declines are caused by improved technology the new levels may be new normal levels. In any case, if some companies are hurt they will not likely be the wiser older ones. The value of research is discussed as a factor in the lowering of costs.

E. B. Shultz

10. CHEMICAL ENGINEERING

Adsorption

Watkins, C. H. (assigned to Universal Oil Products Co.) SEPARATION OF GASES AND VAPORS IN A FLUIDIZED ADSORPTION PROCESS. U. S. 2,687,783 (1954) August 31.

This improved adsorption processing operation provides means for carrying out the fractionation or separation of desired components of a mixed stream by effecting the fluidized contacting of a sub-divided solid adsorptive material and subsequently recovering desired fractions or gaseous components from separately withdrawn streams of the solid materials, with each withdrawn stream being stripped in a fluidized manner within separate stripping zones.

S. Volchko

Cracking Unit Design

Fair, J. R. and Rase, H. F. PROCESS DESIGN OF LIGHT HYDROCARBON CRACKING UNITS. *Chem. Eng. Progress*, 50, 415-420 (1954) August.

The design of cracking coils for hydrocarbon pyrolysis is approached by considering both commercial practice and fundamental reaction kinetics. Basic design equations are derived, and the calculation procedure is outlined. A sample problem is worked completely, showing the stepwise method of development. Six working charts show product distributions, heats of cracking, heat capacities, reaction velocity constant and other data as functions of conversion or temperature.

E. B. Shultz

Gas-Liquid Contact

Johnstone, H. F., Feild, R. B., and Tassler, M. C. GAS ABSORPTION AND AEROSOL COLLECTION IN A VENTURI ATOMIZER. *Ind. Eng. Chem.*, **46**, 1601-08 (1954) August.

This paper gives the results of a study on Plexiglass Venturi scrubbers, 1⅛ to 1½ inches in throat diameter and 1½ to 3 inches in throat length, for the following cases: 1) the absorption of sulfur dioxide by alkaline solution and of oxygen by water; 2) the desorption of carbon dioxide from aqueous solutions; and 3) the collection of aerosol particles formed by reaction of ammonia with sulfur dioxide or hydrogen chloride, or by condensation of dibutyl phthalate vapor. The gas velocity through the throat varied from 200 to 660 feet per second, and the liquid injection rate from 90 to 915 millitres per minute. The efficiency terms were found as functions of the distance from the nozzle and of the gas and liquid rates for three controlling mechanisms, viz., gas-phase diffusion, liquid-phase diffusion, and impaction caused by inertial forces. S. Hu

Grinding

Bond, F. C. CONTROL PARTICLE SHAPE AND SIZE. *Chem. Eng.* **61**, 195-198 (1954) August.

An estimate of at least two dimensions which characterize particle shape can be obtained by conventional methods using square hole and slotted hole sieves. The third dimension of maximum length of particle is estimated most accurately by counting the number of particles lying on their flattest side and adjacent to one another within a measured rectangular area. The alteration of particle shape from crushing operations, such as increasing the cubicity, may be accomplished by: a) increasing breakage by impact rather than by attrition, b) increasing the number of reduction stages and reducing the reduction ratio of each stage, c) use of direct breakage between metal surfaces rather than by cushioned breakage between particles of the material, d) crushing by direct impact rather than by glancing blows, e) breakage across rather than parallel to grain boundaries, and f) reducing the moisture content in dry grinding operations. Additional consideration is given to the effect of grinding machine characteristics on particle shape, particle-size distribution laws and energy requirement in crushing. C. G. von Fredersdorff

North, R. GRINDING PRACTICE AS RELATED TO THE CHARACTERISTICS OF MATERIALS TO BE FULVERISED. *Inst. Chemical Eng. Trans.* (British) 32, No. 1, 54-60 (1954).

A general discussion is presented of the properties of materials as they influence the choice of grinding and classifying equipment. Some of the properties considered include: hardness, toughness, abrasiveness, structure and moisture content. E. J. Pyrcioch

Heat Exchangers

Gilmour, C. H. SHORTCUT TO HEAT EXCHANGER DESIGN—VII. *Chem. Eng.*, **61**, 199-206 (1954) August.

A shortcut method is presented for the design of reboilers involving nucleate boiling inside vertical tubes or outside horizontal tubes. Pertinent design equations, computation sheets, nomographs, and sample calculations are given. This is the last of a series of seven articles on shortcut methods for heat exchanger design. S. Hu

Katz, D. L., Knudsen, J. G., Balekjian, G., Grover, S. S. FOULING OF HEAT EXCHANGERS. *Petroleum Refiner*, **33**, 123-125 (1954) August.

Comparison of the performance of ¾-inch finned-tube and plain-tube heat exchangers indicates that the fouling factors for both types are similar and below the value of 0.005 specified by the Standards of Tubular Exchanger Manufacturers Association. The tests were carried out by continuously circulating No. 5 fuel oil on the shell side of the 8-inch tube-bundle exchangers for a period of four weeks, cooling water or heating steam being passed inside the tubes. Cleaning both bundles with kerosene-water-detergent emulsion was found to restore the heat transfer to essentially its initial condition. S. Hu

Sweeney, R. J. HOW TO DESIGN FOR LOW TEMPERATURES. *Chem. Eng.* **61**, 197-202. (1954) July.

The article is a digest of the more common equations for heat and mass transfer and fluid friction applied to sensible and latent heat transfer in low-temperature exchangers. C. G. von Fredersdorff

Oxygen Separation

Collins, S. C. (assigned to Joy Manufacturing Co.) METHOD OF AND MEANS FOR TREATING GASES. U. S. 2,685,183 (1954) August 3.

The patent refers to improvements in air separation by low-temperature fractionation, particularly in the manner of heat exchange and in the compression of liquid oxygen to a delivery pressure above the column pressure.

C. G. von Fredersdorff

Pipe Friction

DETERMINATION OF FRICTION FACTORS FOR GAS PIPES. *Coke and Gas* (British) 16, 323-24 (1954) August.

German research on pressure drops in pipes of 100-mm size in the Reynolds-number range from 10^4 to 10^6 at pressures up to 60 psi is reported. Smooth brass pipe, painted steel pipe partially rusted, rusted steel pipe and pipe encrusted with tar and naphthalene were tested. For the rough pipe at the low Reynolds numbers, the friction factors did not approach the data for the smooth pipe except possibly for the cases of slight roughness. The data supports the claim that at sufficiently high Reynolds numbers the friction factor becomes independent of Reynolds number, and depends only upon pipe diameter and wall roughness.

R. F. Bukacek

Production Principles

Hoog, H. THE IMPORTANCE OF CHEMICAL ENGINEERING STUDIES IN RELATION TO PROCESS DEVELOPMENT. *Inst. Chem. Engrs. Trans.* (British) 32, 61-72 (1954) August.

The significance of process development as research in the improvement of production is treated. The development of three processes is described, with particular reference to the principles underlying each one and the application of the methods of chemical engineering to the problems which were encountered.

R. F. Bukacek

Tank Mixers

Rushton, J. H. MIXERS FOR LARGE TANK BLENDING. *Petroleum Refiner*, 33, 101-107 (1954) August.

A thorough discussion on the problems associated with mixing and blending operations carried on in large tanks. W. G. Bair

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Computing Devices

Platt, A. MECHANICAL ANALOG-COMPUTING ELEMENTS AND THEIR APPLICATIONS TO AUTOMATIC CONTROL. *Am. Soc. Mech. Eng. Trans.* 76, 883-88 (1954) August.

Some representative mechanical computing elements are described. The manner in which these computing elements can be utilized in computing systems applicable to the automatic control of industrial processes also is discussed. As examples, a computing flowmeter and a multi-element controller for a heat-transfer process are presented. B. E. Eakin

Dust Filter

Caplan, K. J. A SELF-CLEANING AIR FILTER DETAILS OF THE HERSEY REVERSE-JET FILTER. *Chem. Eng. Progress*, 50, 409-414 (1954) August.

The air filter which consists of a cylindrical tube of a dense wool felt filter material is provided with a slotted tube. This is moved across the filtering medium and directs a high velocity jet of gas through it in a reverse direction to that of the normal gas flow. Dust particles are thus dislodged and blown free of the filter medium, restoring the original porosity of the medium. Movement of the jet ring is controlled by the pressure drop across the filter medium, operation starting when the resistance increases to a pre-set value and stopping when the resistance is decreased. A collection efficiency of 99.9% or better, on a weight basis, has been attained by such units using filter ratios (CF per min of gas per sq ft of filter area) between 5.3 and 32.5. E. J. Pyrcioch

Flow Meter

Orlando, V. A. and Jennings, F. B. THE MOMENTUM PRINCIPLE MEASURES MASS RATE OF FLOW. *Amer. Soc. Mech. Engrs. Trans.*, 76, 961-65 (1954) August.

The principle of operation, mechanical features and operating characteristics of a type of mass flowmeter are described. The unit consists of two similar cylinders placed end-to-end in a

closely fitting housing. The fluid flows through a number of passages located at the periphery of the cylinders. The first cylinder is rotated at constant speed and the second cylinder, designed to remove all the angular momentum from the fluid stream that was imposed by the first turbine develops a torque which is a measure of the mass rate of flow. In principle this meter is applicable to the measurement of gas flows, although the experimental work reported concerned operation of liquids only.

R. F. Bukacek

Velten, H. J. and Ziebolz, H. (assigned to Askania Regulator Co.) DIFFERENTIAL PRESSURE FLOW RATE MEASUREMENT DEVICE. U. S. 2,687,645 (1954) August 31.

This invention concerns a special type of orifice plate with a segmented annular orifice rather than the common circular opening. This type of orifice may have application to some gas industry problems but is not at all likely to replace the conventional type.

R. F. Bukacek

Wildhack, W. A. REVIEW OF SOME METHODS OF FLOW MEASUREMENT. *Science*, 120, 191-7 (1954) August 6.

Of particular interest is the description of various mass flow meters, including the Coriolis-force meter, spin-tongue meter, helical flow cylinders, and Magnus-effect meters.

R. F. Bukacek

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Bird, J. R. BUREAU OF MINES DEW POINT RECORDER. p. 195

Resko, P. V. METER STANDARDIZATION IS VITAL. p. 196

12. MATERIALS OF CONSTRUCTION

Concrete Pipe Lines

Sedijatmo, R. M. CAST-IN-PLACE CONCRETE HIGH-PRESSURE PIPE LINES. *Gas Times* (British) 80, 286-291, 92-294-296. (1954) Sept.

The pros and cons of reinforced concrete for pressure pipes are briefly outlined, and some existing systems for pressure pipes are discussed, with emphasis on the essential features of each system. A new type pressure pipe suitable for very high heads is developed, which possesses, besides water and air tightness, great strength against positive as well as negative. pressure surges (water hammer). Small or large diameter lines for any gradient and for conduits of not too great lengths can be cast-in-place without expansion joints. Therefore, this system is very suitable for hydro-electric plant penstocks, or for underground pressure lines for oil or gas transportation.

B. E. Eakin

Corrosion

VALVES TO COMBAT CORROSION. *Chem. Eng.*, 61, 198-204 (1954) September.

In this article 75 questions and answers are presented which will be of value in selecting the proper materials for valves, thereby minimizing interference with production caused by their failure due to corrosion.

S. Volchko

Plastics Construction

Laaff, G. S. PLASTICS FOR CHEMICAL ENGINEERING CONSTRUCTION—UNPLASTICIZED POLYVINYLCHLORIDE. *Chem. Eng. Progress*, 50, 275-282 (1954) June.

Unplasticized polyvinyl chloride is preferred for plastic construction because of its physical and chemical properties, general processability, fabricating possibilities, and economic factors. The article contains graphs, tables, and illustrations that concern its production and utilization.

A. J. Tulis

Refractory Metals

Everhart, J. L. NEW REFRACTORY HARD METALS. *Materials and Methods*, 40, 90-92 (1954) August.

Materials which have characteristics of both metals and ceramics and are sometimes called cermets now include a new group consisting of borides of the transition metals and nickel aluminides. These have excellent high-temperature properties, and corrosion and wear resistance. Properties are tabulated for zirconium boride, chromium boride, molybdenum boride and nickel aluminide. All possess high melting points, that of zirconium boride reported as 5400° F. A number are now available commercially.

E. J. Pyrcioch

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